EXPRESSION OF INTEREST

1. Contact details

Country	TURKEY
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2. Short description of the organisation

Provide a short description of the equipment available, the relations with the industry, the profile of the main researchers.

Novosim has been serving automotive industry for the last 13 years in vehicle development for noise and vibration related attributes.

We have develop various solutions including:

1) Dynomemeter systems for component testing
   (https://www.youtube.com/watch?v=5jhVT7NTA-U)
2) End of line quality monitoring systems (https://novosim.com/end-of-line-testing-systems/)
3) Alpha Cabins (small reverberation rooms) for material acoustic property testing
4) Vehicle testing systems and software
5) Gear testing systems and software

So far, we had the opportunity to work with commercial vehicle producers in Turkey and China. Also, system manufacturers in the US and Italy. Therefore, we are well aware of the product development cycle and the issues which vehicle manufacturers experience.

Mert Doganli is the main researcher and project manager for noise and vibration related areas. He received his MS and Ph.D. ME degrees from Texas Tech University focusing on vibrations and acoustics. Published several papers and hold a patent for vehicle acoustic alerting systems (AVAS).

3. Specific skills related to the project

Indicate the specific skills and competence in relation with " HORIZON-CL5-2024-D5-01-05" topic

The scope of the call is; The data driven development of software-defined functions and systems of EVs (e.g. in context of battery and e-motor control, predictive eco-driving functions or control of vehicle dynamics, as well as comfort) requires the use of improved tools across domains (e.g. mechanical, dynamic, electrical, and acoustical) and scales (from component to vehicle in a mobility scenario) as well as a deep understanding of the vehicle operation in real life.

One of the outcomes is;
`Increase speed of innovation by optimising the utilisation of data` and as stated in the previous paragraph, comfors is one of the areas especially for EVs.

It is possible to develop an acoustical digital twin of a vehicle (from L-category to Heavy Duty vehicles) even before the vehicle exists. In this case, we can make use of the existing data supported with AI based solutions to predict the potential noise levels in the passanger compartment. For example, gear related whines may be very dominant in commercial electric vehicles. There may be variation in the gear boxes (related to the noise levels). So when enough data is available, a range of potential sound pressure levels can be estimated from each source and then combined to build the full acoustic model of the vehicle. We can even incorporate the AVAS system response in this model. In automotive industry, this methodology is generally used as transfer path analysis. So far, we have not seen a model reinforced with AI , so that the statistical effects can be taken into account.

As Novosim, we have taken part in developing such models more than once with successful applications and demonstrations in the auto industry. Therefore, we believe that, we can contribute to this project call for improving the comfort innovation processes.

4. Proposed activities for the project
Indicate which activities you would like to implement during the project

We would like to take part as a technology provider and take part in the development of an AI assisted noise level prediction tool. The reason for this is because, most of the NVH development work for OEMs concentrate on overall level measurement, 1/3 Octave calculations and some other typical post processing methodologies (waterwalls etc.). It is not hard to say that %80 of the analysis and reporting focus on %20 of the available post processing methods. In order to improve the product development time, whole this process can be reduced with the help of AI supported analysis and prediction.

OEMs are well aware of customer requirements for noise and vibration related issues. So, the levels and the types of noises where the customer will be annoyed are well known. With the development of such an automation tool, it is pretty much possible to predict the range in which the sound pressure levels will be at , helping out even junior engineers to make a quick judgement on the status.

So there are 2 novelties;
1) AI based post processing depending on the vehicle type and customer expectations.
2) AI based prediction with the help of available data to estimate the final product's noise levels.

Both will help reduce the complexity and the product development time. Engineers will focus on high level contributions rather than repetitive post processing cycles. With the help of the prediction model, it would be possible to say even before the start of the program, if the vehicle will be acceptable or not.

5. References

Previous research projects

Project acronym / starting date	Main objectives	Main activities	Role in the project
TÜBİTAK 1511 (No: 1120157) / 09.05.2013	Development of an AVAS system for EVs.	*Develop an AVAS system which will adhere to the FMVSS141 and ECE R138 standards. Patented (*TR 2017 06208B)*	Project owner
TÜBİTAK 1511 (No: 1160463) / 25.07.2018	Dynamics of axle gear systems (spiral bevel) and development of a testing system	*Develop an open source simulation tool for hypoid gear geometry and dynamic analysis. *Design and develop the controls and user interfaces for the dynamometer.	Project partner (with Base Studio)
TÜBİTAK 1507 (No: 3191247) / 20.12.2019	Robotic autonomous charging interface for electric vessels	*Design and development of a robotic charger interface. *Control system development. *REGBES BV was established in the Netherlands in 2022 as a spin off).	Project partner (with Elkon Elektrik)
TÜBİTAK-BIF (No: 120N677) / 01.02.2021	Development of collaborative autonomous picker robots	*Design and development of autonomous picker robots for item picking. *Development of control software.	Project partner (with Link Robotics and Bahcesehir Uni.)
KOSGEB AR-GE/ 04.11.2022	Product improvement for alpha cabin.	*Improve the design of an existing alpha cabin (manufactured by Novosim) and the user interface to meet customer demands.	Project owner